light to be scattered in all directions because this gives a broad viewing angle for their displays. Nor is there a solar concentrator in the Jacobson patent. We feel that our unique invention is neither obvious, nor anticipated by the prior art.

II. Specific Responses to Points Raised in Office Action Mailed Oct. 18, 2004

The subject numbers used here correspond to those of Examiner Tra's Action. I quote his relevant statements and give our replies.

1. "The drawings filed on 02/25/2004 are considered formal by the examiner." Applicants are glad that Examiner Tra finds that our drawings are acceptable.

2. Quotation of 35 U.S.C. 102 (b): Prior Publication

3. "Claims 1, 3, 4, 5, 7, 8 are rejected under 35 U.S.C. 102 (b) as being anticipated by Engler et al (U.S. Pat. 6,521,145 B1)."

Applicants respectfully disagree. Engler et al does not anticipate these claims for many reasons.

a) The word mirror (or any variation of it) does not occur in Engler. His particle 418 is not a rotatable mirrored ball. Nor can 418 function as a mirror. Reflection from 418 is diffuse such as from paper, a wall, a desk, etc., and not at all specular as from a mirror. Reflection from the mirrored balls in our invention is specular. As explained in paragraph 2 of the Background secition of our specification, "On the contary, diffuse reflection needs to be increased from the balls so the Gyricon display may easily be observed from all angles." Diffuse reflection is needed for the displays of the prior art.

b) Although Engler's fluid is a dielectric lubricant, it does not have to match the index of refraction of the surrounding material. In the detailed description of Fig. 1, paragraph 2 of our specificiation, we teach:
"It is preferable to utilize a liquid 18 whose index of refraction matches the clear hemisphere or clear hemicylinder, and it should have the same density as element 1 to minimize buoyant forces. The index of refraction of the sheet 17,

the liquid 18, and the optically transmissive upper portion of elements 1 should all be approximately equal." This is crucial for us because of specular reflection, but clearly not important to Engler et al because they use diffuse reflection.

Neither the term "index of refraction" nor the words "index," "refraction" separately occur in Engler. We use the term "index of refraction" both in the specification and in Claim 14:

"Claim 14. The method according to claim 9, wherein the index of refraction of at least one of the fluids approximately matches that of said sheet."

4. "Claims 9, 10, 12-18 and 20-23 are rejected under 35 U.S.C. 102 (b) as being anticipated by Sheridon et al. (U.S. PAT. 5,982,346 A)."

Applicants respectfully disagree. Sheridon et al does not anticipate these claims for many reasons.

a) "With respect to claim 9, Sheridon ...the mirrored balls (item 1545)...."

Sheridon does not have mirrored balls. The color planes inside the balls are not mirrors, they are opaque colors such as red, orange, blue, yellow, green, indigo, violet, cyan, magenta, pink, brown, or beige for color mixing. The word mirror never occurs together with the word ball, but occurs only once in the entire patent. An external mirror 1503 is mentioned in Fig. 15A, in paragraph 2, "Laser light for the image is produced by scanning laser 1502 in conjunction with mirror 1503 and lens 1504, in a manner like that used in known laser printing and digital xerographic techniques."

b) "With respect to claim 10, Sheridon ... eliminatable tray (item 1538) ..."

Sheridon et al does not use the word "eliminatable" or any synonym of it in their patent, as they use a "holding platform 1538" which is permanent and separate from their completed device. They say in Fig. 15C, in paragraph 1, "A section 1542 of partially cured elastomer from receiving surface 1530, onto which the colored ball image has been transferred from storage drum 1525, has been

removed to a holding platform 1538 and placed between retaining walls 1539a, 1539b as shown."

We say in the detailed description of Fig.2, in paragraph 1 "The tray 4 holds the elements 1 in place during curing, and is preferably dissolved in the process."

Since Sheridon et al is not a solar concentrator, we have amended base claims 9, 5, and 1 to specify a solar concentrator

c) The fluid is dielectric. **However, Sheridon et al is not a solar concentrator. We have amended base claims 9, 5, and 1 to specify a solar concentrator**

d) "... index of refraction ... fluid ... matches sheet. (610);" **Yes, but Sheridon et al is not a solar concentrator. The instant invention reflects light specularly with micro-mirrors embedded in balls for solar energy concentration, and Sheridon et al does neither of these things. We have amended base claims 1, 5, and 9 to specify a solar concentrator.**

"...density of at least one of the fluid approximately matches that of the mirrored balls;" **We have already established in a) that the balls are NOT mirrored. We could find no statement that the fluid density approximately matches that of their balls in Sheridon et al.. Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator.**

"... fluid is lubricated." **We could find no occurance of any variation of the word "lubricate" in Sheridon et al. Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator.**

"... infiltrating fluids is vaporously removed;" **We could find no occurance of such a statement or of any words related to "vapor." Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator.**

"... wherein the volume of the material of the sheet (610) to the volume of the mirrored balls is greater than a factor of 2 (col.9 lines 35 -39)." No such statement or even remotely similar statement appears in col.9 lines 35 -39, nor anywhere in Sheridon et al. Their balls are not mirrored. The word "volume" does not occur anywhere in their patent. The word "factor" as in "factor of 2" does not occur anywhere in their patent. They only refer to physical factors. Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator; and amended dependent claim 18 to make it more acceptable.

d) "... wherein the mirrored balls (1545) are precoated ..;" The balls are not mirrored, and we could not find the word "precoat" or "precoated" in Sheridon et al. Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator.

"herein the mirrored balls are asymmetrically closer to the top of the sheet (610) than to the bottom;" The balls are not mirrored, and we could not find any variation of the word "asymmetrical" in Sheridon et al. Nor could we find any statement that the balls are closer to the top of the sheet. Nevertheless, we have amended base claims 1, 5, and 9 to specify a solar concentrator.

"wherein the sheet is constructed of "laminar film." We could not find any variation of the word "laminar" in Sheridon et al. Nor does the word "film" occur in the description of their invention. Nevertheless, we have amended base claims 1. 5, and 9 to specify a solar concentrator.

5. Quotation of 35 U.S.C. 103 (a): Obviousness

6. "Claims 2 and 6 are rejected ...." We have already established in 4 a) that Engler's balls are NOT mirrored.

"... Jacobson ... solar cell concentrator."

Jacobson briefly mentions a "solar cell," but he nowhere mentions a "solar cell concentrator" or "solar concentrator." The word "concentrator" does not occur

in Jacobson, nor any variation of it. We say in our Definitions section: "'Concentrator' as used herein in general is a micro-mirror system for focusing and reflecting light. In a solar energy context, it is that part of a Solar Collector system that directs and concentrates solar radiation onto a solar Receiver."

7. [6.] "Claim 19 is rejected .... holding the mirrored balls ... surrounding the rotatable mirrored balls ..." **Neither Engler nor Sheridon have "mirrored" balls as previously established. No variation of the word "mirror" occurs in either patent.**

None of the cited references, Engler, Sheridon, or Jacobson deal with a "solar concentrator. We have amended base claims 1, 5, and 9 to specify a solar concentrator.

8. "Claims 11 and 24 ... would be allowable ...."

We thank Examiner Tra for indicating that claims 11 and 24 would be allowable. We have amended the base claims 1, 5, and 9, and in view of the great differences between our invention and the cited references, we think that claims 11 and 24 are presently allowable.

III. Amendment of Claims

Applicants have amended claims to further distinguish them from the cited references in accord with Examiner Tra's findings, and in keeping with their consciences as explained in the above responses to the Office Action. Two claims, namely Claims 2 and 6 are cancelled.

CLAIMS

1 (Currently amended): A miniature optics, ball holding solar concentrator sheet comprising:

a) an array of rotatable mirrored balls for concentrating solar energy are embedded in said sheet;

b) said array disposed behind an optically transmissive surface;

c) each of said mirrored balls encapsulated in a surrounding medium of an optically transmissive fluid; and

d) electric coupling means to rotate said mirrored balls within said sheet.

2 (cancelled): The apparatus of claim 1, wherein said sheet is a part of a solar concentrator.

3 (Original): The apparatus of claim 1, wherein said fluid is a lubricant.

4 (Original): The apparatus of claim 1, wherein said fluid is a dielectric.

5 (Currently amended): A method for improving the rotatability of mirrored balls disposed in a miniature optics, ball holding solar concentrator sheet comprising the steps of:

a) providing said sheet with an optically transmissive surface;

b) surrounding said mirrored balls for concentrating solar energy with a shell of a lubricating fluid; and

c) electromagnetic coupling means to rotate said mirrored balls within said sheet.

6 (cancelled): The method according to claim 5, wherein said sheet is a part of a solar concentrator.

7 (Original): The method according to claim 5, wherein said fluid is optically transmissive.

8 (Original): The method according to claim 5, wherein said fluid is a dielectric.

9 (Currently amended): A method for fabricating lubricating receptacles containing encapsulated rotatable mirrored balls in an optically transmissive solar concentrator sheet by means of at least one infiltrating fluid, the method comprising the steps of:

a) holding said mirrored balls for concentrating solar energy somewhat rigidly captive in place in said sheet during and at the completion of its formation; and

b) introducing said infiltrating fluid to expand said sheet and form small fluid-filled annular cavities surrounding said rotatable mirrored balls.

10 (Currently amended): The method according to claim 9, wherein at least one ~~eliminatable~~ dissolvable tray holds said mirrored balls in place in said sheet during its formation.

11 (Original): The method according to claim 9, wherein at least one pillar supports said sheet to enhance fluid access during the sheet infiltration and expansion process.

12 (Original): The method according to claim 9, wherein at least one of the fluids is optically transmissive.

13 (Original): The method according to claim 9, wherein at least one of the fluids is a dielectric.

14 (Original): The method according to claim 9, wherein the index of refraction of at least one of the fluids approximately matches that of said sheet.

15 (Original): The method according to claim 9, wherein the density of at least one of the fluids approximately matches that of said mirrored balls.

16 (Original): The method according to claim 9, wherein at least one of the fluids is lubricating.

17 (Original): The method according to claim 9, wherein at least one of the infiltrating fluids is vaporously removed.

18 (Currently amended): The method according to claim 9, wherein the ratio of the volume of the material of said sheet to the volume of said mirrored balls is ~~greater than~~ between a factor of 2 to 3.

19 (Original): The method according to claim 9, wherein at least one monolayer of said rotatable mirrored balls is encapsulated in said sheet.

20 (Original): The method according to claim 9, wherein a random dispersion of rotatable mirrored balls are encapsulated in said sheet.

21 (Original): The method according to claim 9, wherein the mirrored balls are pre-coated prior to being embedded in said sheet.

22 (Original): The method according to claim 9, wherein the mirrored balls are asymmetrically closer to the top of said sheet than to the bottom.

23 (Original): The method according to claim 9, wherein said sheet is constructed of laminar films.

24 (Original): The method according to claim 9, wherein zeolytes are in the fluid bath to help keep it clean and deionized.

CLAIMS

1 (Currently amended): A miniature optics, ball holding solar concentrator sheet comprising:

a) an array of rotatable mirrored balls for concentrating solar energy are embedded in said sheet;

b) said array disposed behind an optically transmissive surface;

c) each of said mirrored balls encapsulated in a surrounding medium of an optically transmissive fluid; and

d) electric coupling means to rotate said mirrored balls within said sheet.

2 (cancelled): The apparatus of claim 1, wherein said sheet is a part of a solar concentrator.

3 (Original): The apparatus of claim 1, wherein said fluid is a lubricant.

4 (Original): The apparatus of claim 1, wherein said fluid is a dielectric.

5 (Currently amended): A method for improving the rotatability of mirrored balls disposed in a miniature optics, ball holding solar concentrator sheet comprising the steps of:

a) providing said sheet with an optically transmissive surface;

b) surrounding said mirrored balls for concentrating solar energy with a shell of a lubricating fluid; and

c) electromagnetic coupling means to rotate said mirrored balls within said sheet.

6 (cancelled): The method according to claim 5, wherein said sheet is a part of a solar concentrator.

7 (Original): The method according to claim 5, wherein said fluid is optically transmissive.

8 (Original): The method according to claim 5, wherein said fluid is a dielectric.

9 (Currently amended): A method for fabricating lubricating receptacles containing encapsulated rotatable mirrored balls in an optically transmissive solar concentrator sheet by means of at least one infiltrating fluid, the method comprising the steps of:

a) holding said mirrored balls for concentrating solar energy somewhat rigidly captive in place in said sheet during and at the completion of its formation; and

b) introducing said infiltrating fluid to expand said sheet and form small fluid-filled annular cavities surrounding said rotatable mirrored balls.

10 (Currently amended): The method according to claim 9, wherein at least one dissolvable tray holds said mirrored balls in place in said sheet during its formation.

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12 (Original): The method according to claim 9, wherein at least one of the fluids is optically transmissive.

13 (Original): The method according to claim 9, wherein at least one of the fluids is a dielectric.

14 (Original): The method according to claim 9, wherein the index of refraction of at least one of the fluids approximately matches that of said sheet.

15 (Original): The method according to claim 9, wherein the density of at least one of the fluids approximately matches that of said mirrored balls.

16 (Original): The method according to claim 9, wherein at least one of the fluids is lubricating.

17 (Original): The method according to claim 9, wherein at least one of the infiltrating fluids is vaporously removed.

18 (Currently amended): The method according to claim 9, wherein the ratio of the volume of the material of said sheet to the volume of said mirrored balls is between a factor of 2 to 3.

19 (Original): The method according to claim 9, wherein at least one monolayer of said rotatable mirrored balls is encapsulated in said sheet.

20 (Original): The method according to claim 9, wherein a random dispersion of rotatable mirrored balls are encapsulated in said sheet.

21 (Original): The method according to claim 9, wherein the mirrored balls are pre-coated prior to being embedded in said sheet.

22 (Original): The method according to claim 9, wherein the mirrored balls are asymmetrically closer to the top of said sheet than to the bottom.

23 (Original): The method according to claim 9, wherein said sheet is constructed of laminar films.

24 (Original): The method according to claim 9, wherein zeolytes are in the fluid bath to help keep it clean and deionized.

Respectfully submitted,

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